PES-0041

CLAIMS

1. (Original) A membrane electrode assembly for an electrochemical cell, comprising:

a first electrode;

a second electrode; and

a membrane disposed between the first electrode and the second electrode, the membrane comprising a substrate providing support to the first electrode and the second electrode, the substrate being contiguously disposed at a first frame.

2. (Original) The membrane electrode assembly for an electrochemical cell of claim 1, wherein the substrate includes a proton exchange material disposed thereon.

3. (Original) The membrane electrode assembly for an electrochemical cell of claim 1, wherein the substrate is a screen.

4. (Original) The membrane electrode assembly for an electrochemical cell of claim 1, wherein the substrate is a porous planar member.

5. (Original) The membrane electrode assembly for an electrochemical cell of claim 1, wherein the first frame comprises a first frame half and a second frame half between which the substrate is disposed.

6. (Original) The membrane electrode assembly for an electrochemical cell of claim 1, further comprising a flow field support member disposed adjacent to the first electrode, the flow field support member being contiguously disposed at a second frame, the second frame being disposable adjacent to the first frame.

PES-0041

7. (Original) The membrane electrode assembly for an electrochemical cell of claim 1, further comprising a cooling plate disposed adjacent to the first electrode, the cooling plate being contiguously disposed at a third frame, the third frame being disposable adjacent to the first frame.

8. (Original) A membrane for an electrochemical cell, the membrane comprising:
a frame;
a substrate disposed in contiguous contact with the frame; and
a proton exchange material disposed at the substrate.

9. (Original) The membrane of claim 8, wherein the substrate is a screen.

10. (Original) The membrane of claim 8, wherein the substrate is a porous planar member.

11. (Original) The membrane of claim 10, wherein the porous planar member is a particulate material formed to the desired shape of the substrate.

12. (Original) The membrane of claim 11, wherein the proton exchange material is dispersed throughout the particulate material.

13. (Original) The membrane of claim 8, wherein the frame is melted into a peripheral surface of the substrate to obtain the contiguous contact therebetween.

14. (Original) The membrane of claim 8, wherein the frame is extruded into a peripheral surface of the substrate to obtain the contiguous contact therebetween.

15. (Original) The membrane of claim 8, wherein the substrate is from about 20% porous to about 80% porous.

16. (Original) The membrane of claim 8, wherein the substrate is fabricated from a material selected from the group consisting of metals, ceramics, carbon, carbon composites, graphite, and combinations of the foregoing materials.

17. (Original) The membrane of claim 8, wherein the frame is fabricated from a material selected from the group consisting of metals, ceramics, thermosets, thermoplastics, rubber, and combinations of the foregoing materials.

18. (Original) A cooling apparatus for an electrochemical cell, the cooling apparatus comprising:

a frame; and

a plate disposed in contiguous contact with the frame, the plate including a channel disposed thereat, the channel being configured to receive a fluid flow therethrough to transfer heat from the electrochemical cell.

19. (Original) The cooling apparatus of claim 18, wherein the channel is disposed at the plate by an operation selected from the group consisting of photochemical etching, diffusion bonding, machining, and combinations of the foregoing operations.

20. (Original) The cooling apparatus of claim 18, wherein the channel is arranged in a spiral pattern on the plate.

21. (Original) The cooling apparatus of claim 18, wherein the channel is arranged in a continuous parallel configuration on the plate.

22. (Original) The cooling apparatus of claim 18, wherein the frame is melted into a peripheral surface of the plate to obtain the contiguous contact therebetween.

23. (Original) The cooling apparatus of claim 18, wherein the frame is extruded into a peripheral surface of the cooling plate to obtain the contiguous contact therebetween.

PES-0041

24-26. (Cancelled)

27. (Original) An electrochemical cell, comprising:

a first electrode;

a second electrode;

a membrane disposed between the first electrode and the second electrode, the membrane comprising an integrated proton exchange material and a substrate providing support to the first electrode and the second electrode, the substrate being contiguously disposed at a first frame;

a first flow field in fluid communication with aid first electrode opposite said membrane; and

a second flow field in fluid communication with said second electrode opposite said membrane.

28. (Original) The electrochemical cell of claim 27, wherein the proton exchange material is a sulfonated phenol-formaldehyde, sulfonated polystyrene, sulfonated styrene-divinyl benzene copolymer, sulfonated styrene-butadiene copolymer, sulfonated styrene-divinylbenzene-vinylchloride terpolymers, a hydrate of a tetrafluoroethyleneperfluorosulfonyl ethoxyvinyl ether copolymer, a hydrate of a tetrafluoroethylene-hydroxylated copolymer, or a sulfonated fluorocarbon resin.

29. (New) A flow field support member for an electrochemical cell, the flow field support member comprising:

a frame, wherein the frame is melted into a peripheral surface of the flow field support member to obtain the contiguous contact therebetween; and

a support surface disposed in contiguous contact with the frame.

30. (New) A flow field support member for an electrochemical cell, the flow field support member comprising:

a frame, wherein the frame is extruded into a peripheral surface of the flow field support member to obtain the contiguous contact therebetween; and

a support surface disposed in contiguous contact with the frame.